DOCUMENT RESUME

ED 260 014 SO 016 744

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TITLE Programming Equity into Computer Education: Today's Guide to the Schools of the Future. A PEER Computer Equity Action Kit.
INSTITUTION National Organization for Women, Washington, D.C. Project on Equal Education Rights.
PUB DATE 85
NOTE 52p.; Developed by the National Center for Computer Equity, supported by the Women's Educational Equity Act Program. Additional support provided by American Express Foundation, Aetna Life and Casualty Foundation, the Edward W. Hazen Foundation, the Rockefeller Family Fund, the Carnegie Corporation, and the Ford Foundation.
AVAILABLE FROM PEER, 1413 K St., N.W., 9th Floor, Washington, DC 20005 ($9.95).
PUB TYPE Reports - Research/Technical (143) -- Tests/Evaluation Instruments (160)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS Computer Assisted Instruction; *Computer Literacy; Computers; *Educational Discrimination; Elementary Secondary Education; *Equal Education; *Equal Facilities; *Futures (of Society); Sex Differences; *Sex Discrimination; Teacher Attitudes; Womens Education

ABSTRACT

An advocacy packet on educational equity in computer education consists of five separate materials. A booklet entitled "Today's Guide to the Schools of the Future" contains four sections. The first section, a computer equity assessment guide, includes interview questions about school policies and allocation of resources, student and teacher attitudes about computer equity, and a student enrollment analysis instrument. A section, entitled "Strategies for Change," outlines actions which should be taken by community groups, school districts, state governments, teachers, and the federal government. Final sections contain selected resources and a glossary. A four page pamphlet describes the National Center for Computer Equity, its services and membership. A report entitled "Sex Bias at the Computer Terminal--How Schools Program Girls" discusses computer access patterns in the schools, how these patterns affect girls and women, the gender gap in perceived abilities and skills, extracurricular play with the computer, and the role of the teacher in ending computer bias. Two news releases focus on the second decade of activities by PEER, the Project on Equal Education Rights, and on results of a survey documenting gaps between girls and boys in computer skills. (LP)

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PROGRAMMING EQUITY INTO COMPUTER EDUCATION:

Today's Guide to the Schools of the Future

A PEER Computer Equity Action Kit

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of the

PEER Computer Equity Action Kit

I. PROGRAMMING EQUITY INTO COMPUTER EDUCATION: TODAY'S GUIDE TO THE SCHOOLS OF THE FUTURE.....36-page booklet

II. PROJECT ON EQUAL EDUCATION RIGHTS (PEER)/NATIONAL CENTER FOR COMPUTER EQUITY--MEMBERSHIP INFORMATION..... 3-page pamphlet

III. PEER COMPUTER EQUITY REPORT (THE FIRST IN A SERIES OF COMPUTER EQUITY REPORTS).....4-page report

IV. PEER NEWS RELEASES:

"PEER Responds to Grassroots Survey with New Issues and Publication Series to Keep Women's Education on National Agenda".....4-page release

"New Report Documents Gaps between Girls and Boys in Computer Skills".....3-page release

PROGRAMMING EQUITY INTO COMPUTER EDUCATION:

Today's Guide to the Schools of the Future

The National Center for Computer Equity
of the Project on Equal Education Rights
NOW Legal Defense and Education Fund

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ACKNOWLEDGMENTS

Programming Equity Into Computer Education: Today's Guide to the Schools of the Future, PEER's first Computer Equity Action Kit, was written and produced by PEER staff members Lynda Martin-McCormick, Jennifer Tucker, Diana Hellinger, Teresa Layton, and Leslie R. Wolfe, Director, with consultants John Lipkin, Susan Nall Bales, President of Public Affairs Research and Communications. A draft of the Assessment Guide was field tested by Diana Woolis and Ellen Smith-Bigelow of Connecticut PEER.

Final production and printing of *Programming Equity Into Computer Education: Today's Guide to the Schools of the Future* was made possible by a generous grant from the American Express Foundation. Initial development of the kit was supported by the Aetna Life and Casualty Foundation, The Edward W. Hazen Foundation, the Rockefeller Family Fund, the Carnegie Corporation, and the Ford Foundation. The National Center for Computer Equity was established by PEER with support from the Women's Educational Equity Act Program of the U.S. Department of Education.

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Design by Lexicon Graphics.
Cover art by Pat McBride.

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I. COMPUTER EQUITY ASSESSMENT GUIDE

This Guide is intended for parents, teachers, administrators and students who want to find out the extent to which schools support and encourage girls, minority students, students with disabilities, and low-income students to participate in computer education programs and computer-related courses of all kinds.

The Guide is divided into three parts.

Part 1 consists of *interview questions* designed to elicit data about *school policies, practices, and allocation of resources* regarding computer use in the schools. This part of the assessment guide will help you collect information about the number of computers currently in the schools, how the computers are distributed among the student population, and the planning process the school system uses to introduce computers into the schools.

Whatever your school structure, PEER strongly recommends that you contact the superintendent first. He or she is ultimately responsible for the school system and therefore should be given the courtesy of receiving the first contact. The superintendent will be your best source of information to determine who are the key people in the school's computer program.

Part 2 consists of *interview questions* designed to collect data about the *perceptions* of teachers, students and administrators regarding the accessibility of computers to all students, regardless of sex, race, disability, ethnic origin, or socio-economic background.

Part 3 shows you how to analyze student enrollment patterns. This analysis will enable you to pinpoint those computer education courses with low or high participation rates by male and female students of various racial/ethnic groups, and with disabilities.

Enrollment data always should be analyzed by race and by sex and also should identify disabled students. This means identifying the number of disabled and non-disabled female and male students within each racial group. For example, each form has separate categories for disabled Asian-American females and non-disabled Asian-American females; for disabled Black females and non-disabled Black females; and so on for each racial/ethnic-sex category. Collection of these data is very important, since minority and disabled women and girls experience the double (or triple) jeopardy of combined race, sex, and/or disability bias and tend to be most underrepresented in computer education programs. In addition, disabled minority females participate at lower rates than disabled minority males in programs that increase their opportunities to live independent lives. We suspect that this trend may be repeated in computer courses as well; but only you can help document this hypothesis, because these data are not currently being collected by any major educational data collection project. **The data which you collect will be among the first collected on this subject. PEER is very interested in receiving copies of your findings;** please contact us to share your results so that we can share them with others.

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Allocation of Computers

How is the school district developing a computer-based system?

The purpose of these questions is to help you understand how (and if) the district has planned the growth of computer use in the schools. Planned growth is better for many reasons, particularly because the planning process provides the opportunity to incorporate equity from the start.

The questions in ***Part 1*** were designed primarily for administrators. However, equity policies often are ineffectively implemented and their intended results never occur; PEER therefore urges you to seek responses to some of the questions in this section from others—including teachers, counselors, students and parents—who will be able to tell you how policy statements and planning processes are actually put into practice.

1. Does the district or school have a plan for developing and implementing computer education programs? (Request a copy of the plan.)
2. If so, do the goals of the plan include specific actions to ensure equal opportunity for all students? (Find out whether these actions have been implemented or are being implemented, and decide whether you think more needs to be done.)
3. Who is/was involved in developing the plan? (Look for involvement of teachers, community groups, equity advocates and students. Look at representation of women and men of diverse racial and ethnic groups; ask whether disabled persons and/or parents of disabled students are/were involved.)

Are computers distributed equally among schools?

The purpose of this set of questions is to assess whether some schools have more computers than other schools, particularly among schools serving the same grades. If there are discrepancies, you will want to determine whether the schools with *fewer* computers are located in low-income neighborhoods and/or have a higher concentration of minority students.

1. Has the school district analyzed the current distribution of computers to see whether the number of computers available per student is the same at schools throughout the district? If yes, request a copy of the report.

If there are no data on the distribution of computers, use PEER's *Form A—Number of Computers Per Student by Building and Grade Level* (Page 7) to determine the ratio of computers to students in each school.

2. If some schools, particularly those with low-income or minority student populations, have fewer computers available to them, does the school district have a plan to correct this inequity? (If so, request a copy of the plan.) *If not*, ask the following questions:

Why doesn't the school have a plan to correct this inequity? Does the school district plan to address this issue in the near future? If yes, is there a timeline? What is it?

3. If a plan is available, find out if the corrective measures are working. Ask for specific examples of how the measures are working.

Are girls, minority students, and students with disabilities participating in voluntary computer classes in numbers roughly proportionate to their numbers in the school or school district?

The purpose of these questions is to assess whether the school system is effectively providing the same level of encouragement to all segments of the student population or whether hidden (or obvious!) biases exist which preclude the full participation of certain groups (particularly girls, minority students, and students with disabilities). You will need these data to help develop corrective actions.

1. Has the school or school district analyzed the enrollments of students in voluntary computer courses to see whether girls, minority students, and/or students with disabilities are underrepresented? (If so, request a copy of the report. If not, use PEER Forms B and C in Part III, *Student Enrollment Analysis*, to find out.)

2. If the district has found enrollment disparities among girls, minority students, and/or students with disabilities, does the district have a plan for correcting the(se) problem(s)? (If so, request a copy of the plan.)

If not, then ask these questions: Does the school district plan to develop a strategy for correcting these inequities? (If yes, then what is the timeline for developing a strategy? Who will most likely be involved in this process?)

3. If there is a plan, are the corrective measures working? Ask for specific examples.

Computer Clubs and Extra-Curricula Activities

To what extent is the school district encouraging girls, minority, and disabled students to take part in extra-curricular activities?

The answers to these questions will show that simply making clubs and other activities open to all students will not be enough. Teachers and others must actively encourage traditionally underrepresented students, particularly girls, to take advantage of these opportunities to learn. The purpose of this set of questions is to measure the degree to which this encouragement is taking place in your schools.

1. Does the district have a policy or set of program guidelines for extra-curricular computer activities?

2. Is there a district-wide program which promotes extra-curricular computer activities?

Do these policies and/or programs include specific actions to ensure equal participation by girls, minority and disabled students?

If there is no district-wide policy or program guidelines, identify the schools which offer programs and find out how these programs vary among schools. You might want to ask these questions:

How did the programs get started? Who initiated them—students, teachers, parents, administrators? Do the programs enjoy broad support among educators, parents, and others in the community? Are students

enthusiastic? If programs vary among schools, compare them to one another. Do schools in low-income neighborhoods or schools with higher enrollments of minority students offer less extensive programs?

3. Are girls, minority and disabled students participating equally in extra-curricular programs?

4. If girls, minority and disabled students are not participating equally in extra-curricular programs, what is being done to encourage their participation?

Does the school district provide activities for parents and students together?

The purpose of these questions is to assess whether schools are enlisting parents' support for equity goals.

1. Does the district offer any programs to introduce parents to the computer or to invoive parents in computer education activities?

2. If no program is offered district-wide, are any individual schools offering such programs?

3. If so, do these programs highlight the special need for parents to support their daughters' interest in computer education and careers? Do they offer any concrete help for parents in encouraging girls?

Are schools aware of bias in software and are they refusing to purchase biased software?

The purpose of these questions is to ensure that school systems are acting as responsible consumers and that they are using tax dollars to purchase software that has been evaluated for bias as part of the selection process.

Software

1. Is the selection and purchase of software coordinated at the district level, or do individual schools select and purchase their own software?

2. Who reviews and selects software? If it is a committee, who serves on the committee? Examine the composition of the committee by race by sex by disability and by experience in addressing equity concerns as well as expertise in curriculum and software.

3. Does the software selection group review software for race, sex, and disability bias?

4. Has the committee ever rejected a piece of software because it is biased? If so, did it inform the software company of the reason for the rejection?

Are teachers, students, and others in your district or school aware of sex or race or disability bias in the software they are using?

This set of questions will help you test their level of awareness of these issues and also will enable you to review software being used in your district or school.*

1. Are there any human figures used? If so, are they predominantly male or female?

2. Are racial/ethnic minorities depicted? If so, are they shown positively, or are they shown as the "opposition" (enemy) or the less powerful figures?

3. Are disabled people represented? If yes, how are they shown?

4. Are the rewards or outcomes of the activity violent?

5. Is the software available in any language other than English?

These criteria should be combined with other relevant criteria, such as appropriateness of content for achieving the learning objectives, reading level, cost, quality of documentation, and so on.

*Adapted from an article by Joy Wallace and Raymond M. Rose, "A Hard Look at Software: What to Examine and Evaluate," *Educational Technology*, October 1984, pp. 35-39.

Teacher Training

Is the school district ensuring that teacher training includes an effort to sensitize teachers to equity issues in computer use?

This set of questions will help you to assess the quality of teacher training efforts.

1. Does the district have a coordinated effort to train teachers in computer use? For example, does the district offer its own training? Or does it require training from a source which it has screened and approved?
2. Does the training include a component on equity issues in computer use, along with concrete suggestions for actions that participants can take to encourage equal participation by girls and other traditionally underrepresented students?
3. Has the district received any training from federally funded (Title IV) Civil Rights Act sex and race desegregation assistance centers in the recent past? Has the training covered computer equity issues?
4. If teachers have participated in a computer training program that addressed equity issues, how effective was the training? Ask for specific examples.

Career Education

Is the district or school offering non-sexist, non-racist career counseling and career education programs?

This set of questions will help you assess whether the school or district is taking any steps to make sure that counselors and teachers encourage girls to consider jobs and careers in a wide range of high technology and computer-related industries and fields, to the same extent that they encourage boys.

1. Have counselors received sex and race equity training in the recent past?
2. Are counselors encouraging girls, minority students and students with disabilities to explore jobs in computer related fields?
3. Do brochures, pamphlets, bulletin boards and other materials portray women, minorities and disabled persons? If yes, do they depict them in jobs other than the "traditional" stereotyped ones (i.e., word processing operator or data entry clerk)?
4. Are counselors and teachers encouraging girls and boys to take part equally in the school's computer courses?
5. Are counselors and teachers encouraging girls to seek advanced training? Are they steering girls and boys into different fields (word processing for girls and computer programming for boys, for instance)?

National Center for Computer Equity of the Project on Equal Education Rights

FORM A: Number of Computers Per Student by Building and Grade Level

Grade Level of Schools: _____
(Elementary, Middle, Junior High, High School, Other)

Name of School	# of Students	# of Computers	# of Computers per Student

Number of Computers / Number of Students = Number of Computers per Student

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PART 2: INTERVIEW QUESTIONS ABOUT STUDENTS' AND TEACHERS' PERCEPTIONS AND ATTITUDES TOWARDS COMPUTER EQUITY IN THEIR SCHOOLS

Interview with Students

The purpose of this section is to develop a clearer understanding of students' reactions to computers and to equity issues. Pick and choose the questions you want to ask and be sure to interview a diverse cross section of students—including male and female students of all racial/ethnic groups as well as students with disabilities.

1. Are you aware of the computer courses offered by your school?
2. Are you enrolled in a computer course now?
   a. If not, do you plan to enroll in any?
   b. If not, why not?
3. What kind of career would you like to go into once you finish school?
   a. What kind of education (college, vocational-technical school, graduate school, professional school, etc.) do you think you need for your chosen career?
   b. Do you think that knowing how to use a computer would be helpful to you in that career? Will it be essential?
   c. What courses are you taking now to prepare you for your chosen career?
4. Do you have any experience in programming a computer?
   a. Where are you learning about computers?
   b. How much time do you spend at the terminal in an average week?
5. Do you like using the computer?
   a. What do you like best about it?
   b. What do you like least about it?
6. Do you think girls have an equal chance at taking computer programming courses? Do minority students have an equal chance? Do disabled students have an opportunity to take these courses? Are they provided with the appropriate auxiliary aids they may need to use the computer?
7. Do you think girls and boys can do equally as well in computer courses? Do you think students of all racial and ethnic groups can do equally as well? What about students with disabilities?
8. Do you think there are any differences in the way that girls and boys react to computers?
9. Is there a computer club in your school? Are you active in it?
10. Would you like to have more opportunities to learn about the computer? Do you have any ideas about how to accomplish this?
11. If the school offered a course for parents and students in the evenings or on weekends, do you think that you and your parents would attend?

Interview with Teachers

1. Do you teach any computer skills courses, such as programming, data processing, or computer literacy? (If so, please describe.)

2. (This question should be asked of teachers whose classes have disproportionately high male *or* female enrollments, or classes composed of disproportionately high enrollments of students from one or more racial/ethnic groups, or classes with *no* disabled students; you should interview these teachers *after* you have completed the student enrollment analysis in Part III.) The enrollment in _____ (class name) is _____ percent male and _____ percent female. _____ percent of the female students are _____* (list each racial/ethnic group), as are _____ percent of the male students. None of the students are disabled. *(The percentages for each racial/ethnic group—including Black, Hispanic, Native American, and Asian American—should be included, where relevant). Why do you think this imbalance exists? Is it the result of unconscious tracking of students? Or is it the result of special, positive efforts you have made to recruit minority and female students, to correct their underrepresentation in other courses?

If you believe this imbalance is excluding female, minority, and disabled students:

a. What can be done to correct this imbalance?

b. What efforts have you made so far?

c. Do you think your efforts are having an impact?

d. What else do you think needs to be done?

e. How could your suggestions be implemented?

3. Do you think that girls and boys react differently to the software which you use? Do students of different racial/ethnic backgrounds react differently?

a. How do boys' and girls' reactions differ? How do reactions of minority and majority students differ?

b. What is it about these software packages that elicits different reactions?

c. Do you think this is a problem that school staff should be addressing? What do you think should be done about it?

d. What are you doing in your own classroom to address this issue?

e. What kind of help or support do you need from other teachers, the principal, the school board, and parents?

4. Do you think girls and boys spend equal amounts of time at the terminal during class time, or during free periods? Do students of various racial/ethnic groups spend equal amounts of time at the terminal? Do disabled students have an equal chance at the terminal?

a. If not, why not?

b. What do you think should be done to correct this problem?

c. What are you doing to correct this problem?

5. Do you think that boys find computers more interesting than girls do?

a. If so, why?

b. What can be done to interest girls more?

6. Are girls being steered into career fields traditionally defined as "women's" jobs, such as word processing operator, rather than into "non-traditional" jobs and careers, such as computer systems manager?

a. Is the school system taking any steps to ensure that it does not

contribute to steering girls, particularly minority and disabled girls, into education programs that prepare them primarily for the lower-paying jobs traditionally held by women? If yes, give specific examples.

b. What steps are you taking to ensure that the girls you teach are being encouraged to explore higher-paying jobs in non-traditional fields, computer or otherwise?

c. What kind of help or support do you need from teachers, the principal, the school board, or parents?

7. Are girls being encouraged to take advanced computer courses? What are you doing to encourage girls in this direction?

8. Have you received any training on race or sex equity in the recent past?

9. Have you received any training on race or sex equity that specifically focuses on equity in computer education?

a. If yes, was it effective? Give specific examples.

b. If not, would you like to participate in a training session that addresses equity issues in computer education?

PART 3:

STUDENT ENROLLMENT ANALYSIS

The analysis of student enrollment patterns in computer education courses is the most important aspect of the computer equity assessment process.

Rarely will the district's central administrative office maintain detailed records on how students are enrolling in courses by sex, racial/ethnic group, and disability. Therefore, in most instances, student enrollment data will need to be collected at the school building level. This simple exercise yields information that shows the extent to which female, minority, and disabled students *actually* are participating in computer education programs of various kinds.

Analyzing student enrollment patterns is a three step process. *First*, you will need to determine the composition of the entire student population in the building or district which you are examining. *Second*, you will need to determine the student composition of each computer education course you have identified.

If the enrollment of any group in computer courses is substantially lower or higher than their total enrollment in the school, you will need to take a *third* step: FIND OUT WHY. The school may be doing something to discourage enrollments by this/these group(s). For example, "tracking" is particularly common in vocational education courses. Thus, girls usually predominate in office occupation courses that teach basic data and word processing skills while white males are overrepresented in computer programming courses.

Below is a step-by-step guide for analyzing student enrollment patterns in your local schools.

1. *Use Form B—Total Student Population by Sex by Race by Disability* to find out the total number of students enrolled in the school district or school for each population group.

2. *Identify and list the computer education courses* or programs (by title) offered by your schools. This list should include all computer programming and computer literacy courses, as well as any other computer-related courses, such as "Word Processing," "Introduction to Computer Programming," "Computer Literacy I," "Introduction to Data Processing," "Advanced Placement Computer Science," and "Introduction to Structured Programming," for example. The course names will vary from school to school and community to community. Many computer courses will be listed under the offerings of the mathematics department; some will be listed under business departments. If the district has a vocational education program, its courses in computer skills, including data processing, specific computer applications (such as computerized spreadsheets in accounting) and programming should be listed.

3. *Use Form C—Students Enrolled in Computer Education Courses By Sex, By Race, By Disability* to record the number of students enrolled in *each* course.

4. Once you have completed steps 1, 2, and 3 you will have all of the baseline data needed to complete the analysis. *Compare* courses to determine if students are concentrated in courses along gender and racial/ethnic lines and if disabled students are concentrated in certain courses.

For each course, compare the enrollment percentage of each student population group to that group's overall enrollment from Form B: *Total Student Population By Sex By Race By Disability.*

If any group has an enrollment 20 percent lower or higher than its enrollment percentage on Form B, then you need to move to the next step—to find out why. The interview questions in Parts I and II of this Guide will provide many of the answers.

National Center for Computer Equity of the Project on Equal Education Rights

FORM B: Student Population by Sex by Race by Disability

	Number	Number Disabled	Percent of All Students	Percent of Disabled Students
Female Asian-American				
Male Asian-American				
Female Black				
Male Black				
Female Hispanic				
Male Hispanic				
Female Native American				
Male Native American				
Female White				
Male White				
Total				

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National Center for Computer Equity of the Project on Equal Education Rights

FORM C: Student Enrollment in Computer Education Courses by Sex by Race by Disability*

Course Name: _____

	Number	Number Disabled	Percent of Students Enrolled	Percent of Disabled Students Enrolled
Female Asian-American				
Male Asian-American				
Female Black				
Male Black				
Female Hispanic				
Male Hispanic				
Female Native American				
Male Native American				
Female White				
Male White				
Total				

*Note: Use one form for each computer course you are analyzing.

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A more detailed discussion of strategies to bring about change in your schools can be found in PEER's comprehensive manual, *Organizing for Change*. This step-by-step guide provides advice on important community organizing activities: coalition building, using the media, and neutralizing the opposition. *Organizing for Change* is available from PEER for $12.95. The following outline offers some specific recommendations for actions that local community groups, school districts, and government bodies can take to improve your district's computer education programs.

Actions Which Local Community Groups Should Take

1. Assess your school's computer instruction curriculum from an equity perspective, using this Kit's assessment guide. Develop a campaign to change biased practices and enrollment patterns based on your findings.

2. Take your findings to other community groups to enlist their support and ideas and to build community coalitions for change.

3. Organize a meeting between community groups and school leaders to voice your concerns and secure a commitment for change.

4. Join with the school to run a "computer fair," where parents and students can get "hands-on" experience and learn more about future job opportunities.

5. Help your school address the changes you recommend by joining the curriculum committee, parent advisory committee or any other school planning committee that addresses these issues.

6. Hold a community hearing to generate public discussion of the issues.

7. Run a short workshop in the evenings or weekends for parents who want to know more about computer-based education in their children's schools.

8. Sponsor a talk or series of talks for parent groups by people in the community who are knowledgeable about the impact of technology on jobs and on education for women. For example, have a banker talk about how automation is changing jobs traditionally held by women within banking. Ask a woman engineer from a local business to talk about how she became an engineer and what it is like working in a field that is not traditional for women.

9. Sponsor an "Expanding Your Horizons" conference to expose female students to women role models and career opportunities open to them in math, science and computer related fields. For additional information, write to EQUALS, Lawrence Hall of Science, University of California, Berkeley, CA 94720, (415) 642-1823.

10. Ask other organizations, such as church groups and service leagues, to invite you to talk about computer equity issues. Most groups run seminars or have speakers at their monthly meetings, and are often looking for new topics.

11. Share the data you have collected, along with the background information provided by PEER, with your local news editors from print, radio and television media. Give them concrete ideas for stories on equity issues in computer education and careers.

12. Monitor state legislation affecting education. Send your findings to your

local representatives, to key legislative committees, to your chief state school officer and to your governor. See the list of "Actions Which State Governments Should Take" in this Kit.

13. Share your findings with your Congressperson and Senators and meet with them and their key staff when they are in the district.

14. Join PEER's *National Affiliate Network* so that you can keep up-to-date on federal actions affecting equal rights for girls and women in education, through PEER's monthly *Equal Education Alert* and *Action Alerts* on current critical issues, including computer equity. By joining the National Affiliate Network, you will automatically gain access to PEER's National Center for Computer Equity and its programs and publications. The Network also will share information that you send to PEER with groups in other communities who also are working on computer equity issues.

Actions Which Local Districts Should Take

1. Institute a *computer literacy program* open to all students as part of the core curriculum. One of the program's goals should be to neutralize biased images and to encourage girls, minority students and disabled students to participate fully in the program.

2. Make sure that any computer education *training for teachers* includes a focus on strategies that encourage girls, minority students, and disabled students to participate in computer education courses.

3. Provide *in-service training* to teachers and counselors on the impact of computers on the job market, so that they can be more helpful in advising students about career options in the future.

4. Review all *software* before purchasing to make sure it is non-biased.

5. Structure free time on the computer and after-school *computer clubs* so that all students are encouraged to participate, including girls, minority, and disabled students.

6. Offer programs about computers and their impact on jobs and education for *parents and families* in the evenings. Include discussions of equity issues to help parents learn new ways to encourage their daughters as well as their sons to study computer science.

7. Develop *recruiting strategies* that encourage girls, minority students and disabled students to enroll in advanced, optional courses.

8. Develop *partnerships with local businesses*, both to strengthen the computer-based education program and to develop a concrete understanding of the opportunities for employment generated by the computer and related technology in your community.

9. Develop a *planning committee* to manage the process of designing and implementing a computer education program. Infuse equity into all of the goals and objectives of this committee's work. Ask parents and representatives of community groups to participate.

10. Make sure that computers are distributed equitably among schools within the district.

Actions Which State Governments Should Take

1. Develop and fund clearinghouses and other support services for local school districts so that they can exchange information and develop computer education systems in the most cost effective way. Support services should include:

- teacher training;
- evaluation of software;
- model computer literacy programs;
- information on new applications of computers to learning;
- information on how to plan and implement a computer education program;
- information on equity issues in computer education programs and how to build equity goals into the overall program.

2. Provide funding to enable schools to purchase computer hardware and suitable software, as well as auxiliary aids needed to ensure that disabled students have access to the computers.

3. Build partnerships with businesses in the state to link computer education programs to information about job opportunities in industries that are building and using computer technology.

4. Develop and support programs that encourage girls, minority students and disabled students to participate fully in computer education programs. Programs could include summer institutes, after-school programs, and career days, for example.

5. Support and encourage the development of new applications for computers in learning.

6. Develop mechanisms to evaluate computer education in the state, including evaluation of the participation of women, minorities, and disabled students.

7. Implement the provisions of the Education for Economic Security Act, which requires that teacher training in mathematics, science, and technical fields include components that address equity issues. (For more information about the Act, see *Equal Education Alert*, August 13, 1984, Vol. 4, No. 6, available from PEER).

8. Implement the provisions of the Carl D. Perkins Vocational Education Act of 1984, which requires that funds be set aside to ensure access to high quality vocational education (including computer and technical education) for women, disadvantaged students and disabled students. For more information, write PEER for a copy of *Fulfilling the Promise: A Guide to the Sex Equity Provisions of the Vocational Education Act* ($3.00).

Actions Which Classroom Teachers Should Take

It is important that strategies used in the classroom to encourage students to use the computer and to feel comfortable using it *do not* encourage bias or segregation.

1. Encourage more active participation by all students in classroom computer activities by moving away from the traditional seating pattern of rows and columns. Arrange seating so that using the computer becomes a "sharing experience" for students.

2. If students are paired or divided into small groups when using the computer, make sure that single-sex groups or pairs are not created.

3. Organize a "student teacher corps" to help younger or less experienced students learn about the computer. Make sure that the group is racially diverse, including disabled students, and is composed of both girls and boys.

4. Bring in role models for female, minority and disabled students to speak on career opportunities that are available to individuals with computer skills.

5. Make sure that you include both girls and boys when assigning tasks associated with maintaining the equipment, such as moving the computer, making sure it is turned off, or storing the software properly.

6. Make sure that the software being used in your classroom is not biased against female, minority, or disabled students. Software that is very action oriented, violent, or competitive may be alienating to many students, particularly females. (See the criteria on page 4.)

7. Organize a teachers' "network" or support group in your school. The group could meet regularly to share equity strategies, solve problems, and share information about articles, books, and conferences, on issues related to computer equity and the use of computers in the classroom. The group also could be open to teachers who do not have computers in their classrooms, but are interested in these issues.

8. Find out if your district is planning to provide in-service on computer equity issues. If not, approach your building principal or your district's sex equity coordinator to suggest that such training be held; indicate that an in-service addressing equity issues related to the use of the computer in the classroom would be useful to teachers.

9. When establishing procedures for using the computer, *never* rely on a "first come, first serve" rule.

These strategies were synthesized from materials developed by EQUALS and the Women's Action Alliance. For more information on these and other materials for teachers, see **Selected Resources on Computer Equity** in this Kit.

Actions Which The Federal Government Should Take

1. The Women's Educational Equity Act (WEEA) Program should continue to fund projects that design and test new model programs in computer equity—including software, curriculum development, teacher training, and parent education, for example.

2. The Education for Economic Security Act of 1984 should be implemented, with particular attention to the requirement that teacher training in mathematics, science and technical fields include components that address equity issues.

3. The National Institute of Education and the National Science Foundation should fund research on computer education that addresses equity issues.

4. Include equity provisions in any new computer education or technology legislation or regulations.

5. Encourage local districts to spend more time and effort planning their programs before purchasing equipment and software and to address equity issues.

6. Fund the development of local computer education programs addressing equity issues through the Secretary of Education's Discretionary Fund.

7. Fund evaluations of federally supported computer education programs, and require that they include a focus on equity issues.

III. SELECTED RESOURCES ON COMPUTER EQUITY

Books, Articles, Newsletters

"A Hard Look at Software: What to Examine and Evaluate (With an Evaluation Form)," by Joy Wallace and Raymond M. Rose, *Educational Technology*, vol. 24, no. 10, October, 1984, 720 Palisade Avenue, Englewood Cliffs, New Jersey 07632. (201) 871-4007. $6.00 for a single copy.

This article contains practical advice for reviewing software from an equity perspective.

"Bulletins on Science & Technology for the Handicapped," Project on the Handicapped in Science, Office of Opportunities in Science, American Association for the Advancement of Science, 1776 Massachusetts Avenue, NW, Washington, DC 20036. Voice or TTY (202) 467-4496. Free.

This bulletin is published four times a year, and highlights current disability technology research and development. It also reports on new resources, describes upcoming activities in the field, and contains articles of special interest.

Computer Education: A Catalog of Projects Sponsored by the U.S. Department of Education, 1983, Susan S. Klein, editor. Superintendent of Documents, U.S. Government Printing Office, Department 36-JE, Washington, DC 20402. GPO stock no. 065-000-00202-7. (202) 783-3238. $9.00

This catalog briefly describes all of the computer education projects funded by the U.S. Department of Education in 1983. The summary chapter also analyzes the number of projects funded to support equity goals, as well as those focused on other issues. As a result, the catalog provides a comprehensive picture of the federal government's priorities in educational computing.

"Computer Equity," a theme issue of *The Computing Teacher*, vol. 11, no. 8, April 1984, International Council for Computers in Education, University of Oregon, 1787 Agate Street, Eugene, OR 97403-1923. $3.00 plus $2.50 processing charge unless order is pre-paid. Ask for "The Equity Issue."

The twenty-one articles in this issue cover a wide range of topics, including analyses of inequities in computer learning opportunities by leading computer equity researchers, several examples of model school programs, a how-to-guide for identifying bias-free software, and a discussion of a study of solutions for addressing computer bias in schools.

"Computer Equity," an issue of *Equal Play*, vol. IV, nos. 1 and 2, Spring/Fall 1983, the Women's Action Alliance, Inc., 370 Lexington Avenue, New York, NY 10017. Single copies, $5.00. (212) 532-8330.

Equal Play is a resource magazine for adults who are guiding young children beyond stereotypes, focused on non-sexist childrearing and education. This issue is devoted to educational computing and related topics. It includes a report on an informal survey of computer usage patterns among girls and boys at a New York City school; some advice for parents who are overwhelmed by the computer explosion; a review of the research on sex differences in spatial abilities, a report on a national conference on "Microcomputers, Electronic Toys and

Genius Machines in Early Childhood Education," and a discussion of the Computer Equity Training Project of the Women's Action Alliance, funded by a grant from the Women's Educational Equity Act Program.

Computers and Girls: Rethinking the Issues, by Jan Hawkins, Technical Report No. 24, Center for Children and Technology, Bank Street College of Education, 610 West 112th Street, New York, NY 10025. April 1984. $3.00.

The Center for Children and Technology has written extensively on the current use of computers in classrooms. This report provides a troubling picture of sex differences in classrooms in which more than the usual number of computers were available, and teachers were concerned and eager to promote equity in both achievement and opportunity. Hawkins also discusses two other studies conducted by the Center for Children and Technology, both of which reported significant sex differences in preferences for computer-based activities. (The only study which did not document a sex difference was one examining the use of word processing software.) The report also reviews the current research on sex differences in mathematics achievement and interest in science.

Equity and Excellence: Compatible Goals, Office of Opportunities in Science, American Association for the Advancement of Science, 1776 Massachusetts Avenue, NW, Washington, DC 20036. (202) 467-5438 voice or TTY. Free.

Equity and Excellence catalogues pre-college programs that encourage minority students, girls, and students with disabilities to take advanced mathematics, science and technology-related courses. An excellent resource for both schools and parents.

High Tech for Schools, by Shirley Boes Neill, American Association of School Administrators, 1801 North Moore Street, Arlington, VA 22209. Stock no. 021-00122. $12.95 plus $2.50 for postage and handling. Bulk prices available.

The fifteenth in a series of "critical issues" reports, this booklet focuses on planning and implementing a computer-based education program in a school district. The chapter on planning includes a short insert from PEER's kit on computer equity issues, *Programming Equity Into Computer Education*.

IDEAS for Equitable Computer Learning, Center for Educational Equity, American Institutes for Research, PO Box 1113, Palo Alto, CA 94302. (415) 493-3550. Free.

IDEAS for Equity in Computer Learning contains practical strategies that address 12 barriers to equitable learning. These strategies are based on actual experiences of students in grades 1-9, as assessed by AIR's research staff. In addition, teachers of computer programs assisted in designing both the content and format of the booklet. *IDEAS* was produced under a grant from the Women's Educational Equity Act Program.

Parents, Kids, and Computers by Lynne Alpert and Meg Holmberg, Sybex Inc., 2344 Sixth Street, Berkeley, CA 94710. 1984. $4.95.

This book introduces parents to computers and incorporates a sex equity perspective throughout, showing by

example (often of the authors' own children) that girls can excel with computers and that girls and boys can enjoy computers *together*. The book also describes and recommends software, gives advice about buying equipment and programs, and includes chapters on working with your children and their school staff.

Personal Computers and the Disabled, by Peter A. McWilliams, Quantum Press, Doubleday & Co., Inc., Garden City, NY. 1984. $9.95.

Peter A. McWilliams is the author of three best-selling books on computers, *The Personal Computer Book*, *The Personal Computer in Business Book*, and *The Word Processing Book*. McWilliams catalogues adaptive devices for disabled computer users as well as organizations, government agencies, colleges with large disabled student populations, computer societies that focus on the disabled community, newsletters, databanks, magazines, library services, and state agencies and councils. Section on media lists major newspapers (by region) along with the names of editors who cover science, medicine, and computers.

Personal Computers and the Disabled: A Resource Guide, Apple Computer, 20525 Mariani Avenue, Cupertino, CA 95014. 1984. (406) 966-1010. Free.

This guide consists of two basic parts: stories of disabled children whose lives have been improved by adapted Apple computers; and a resource directory of software and hardware made for Apple computers. The computers portrayed are all Apples, and the resources listed are designed to adapt an Apple. Since Apples dominate the school computer market, this is a worthwhile resource to investigate.

Personal Computers and Special Needs, by Frank G. Bowe, 1984, Sybex Inc., 2344 Sixth Street, Berkeley, CA 94710. $9.95.

Frank Bowe, former executive director of the American Coalition of Citizens with Disabilities, has written this book to "put into the hands of handicapped people the knowledge that can revolutionize their lives." In the process he has also written an excellent introduction to adaptive devices that make computers fully accessible to disabled users. The book will be particularly useful for educational and community leaders who are designing or implementing computer education programs for both disabled and non-disabled students. A buyer's guide lists the most extensively used pieces of adaptive equipment.

School Uses of Microcomputers: Reports from a National Survey, Center for Social Organization of Schools, The Johns Hopkins University, 3505 North Charles Street, Baltimore, Maryland 21218. $3.00 for a set of six reports.

The Center for Social Organization of Schools recently conducted a massive national survey of computer use in the schools, collecting in-depth information on how computers are distributed and used by a sample of 2,209 schools. The sample includes both public and private schools, broken down by socio-economic status, race of student body, region, type of school, and degree of urbanization. The results are some of the most detailed available, and have been cited by many as proof of serious inequities in the distribution of computer resources.

Sex Bias in Mathematics, Computer Science and Technology, The Report Card #3, John Lipkin and David Sadker, Mid-Atlantic Center for Sex Equity, 5010 Wisconsin Avenue, NW, Washington, DC 20016. Free.

This "report card" is a large poster that provides information on sex bias in mathematics, computer science and technology, in a concise and readable format. It is especially useful for classroom bulletin boards, in-service training sessions, and conference packets.

The Computer Explosion: Implications for Educational Equity, edited by Sheryl Denbo, Mid-Atlantic Centers for Race and Sex Equity, the American University, 5010 Wisconsin Avenue, NW, Washington, DC 20016. September 1983. Free.

This book is a collection of articles from several magazines, reviewing the issues of race and sex equity in computer education. It includes an overview of computer equity issues, a discussion of instructional uses of computers, articles about evaluating software, including evaluation from an equity perspective, and a statistical overview of "computer workers."

"The Computer Revolution: Guess Who's Left Out?" by Patricia B. Campbell, *Bulletin*, vol. 15, number 3; and "Preliminary Guidelines for Selecting Computer Software," by Patricia B. Campbell, *Bulletin*, vol. 15, number 5; Council on Interracial Books for Children, 1841 Broadway, New York, NY 10023.

The *Bulletin*, published eight times a year by the Council on Interracial Books for Children, analyzes a wide range of learning materials for race, sex and disability stereotypes and other forms of bias, and provides consciousness-raising articles as well as lists of alternative resources.

"The Computer Revolution: Guess Who's Left Out?" provides both enlightening anecdotes of sexism at work in computer education classes, and useful data on participation by women and girls in educational computing. The article shows how computer scarcity interacts with basic male chauvinism:

> "Girls who 'give' their assigned computer time to boys frequently say they did it so that the boy 'will stop bothering me.'[sic] I have heard boys tell girls, when they are out of the teacher's hearing, that there isn't enough time for everyone to use the computer, so the girls had better not show up."

Dr. Campbell also offers concrete advice for tackling male domination (and bad manners).

"Preliminary Guidelines for Selecting Computer Software" describes areas of software content to review for bias, including the degree of violence, the reward context and structure (are they all related to sports?), and the degree of empowerment provided to the user. Campbell points out that "software that 'tells' users what to do at every step may teach facts but it also teaches that the computer is in control. Software that encourages decision-making can teach facts *and* foster the tremendously important concept that people can control computers, not vice versa." This article provides essential guidance to software and textbook review committees as well as to teachers.

"The Resource Chapter" of *The Neuter Computer: Why and How To Encourage Computer Equity for Girls,* by Jo Shuchat Sanders and Antonia Stone, Women's Action Alliance, Inc., 370 Lexington Avenue, New York, NY 10017. (212) 532-8330. $5.00 plus 15 percent for postage and handling.

The book, *The Neuter Computer,* will be published in the fall of 1985. Prior to publication, the authors have released the chapter on resources, which lists articles, audio-visuals, books, magazines, national conferences, organizations, software evaluation sources, and teacher training sources relating both to computer equity and to computer education in general.

The Technology Garden—An Introduction to Computers, Technical Education Research Centers, 1696 Massachusetts Avenue, Cambridge, MA 02138. (617) 547-0430 or -3890.

(To be available in the summer of 1985 through Grolier Electronic Publishing, Inc., 95 Madison Avenue, New York, NY 10016. (212) 696-9750.)

The Technology Garden is a multi-media introduction to computers with the expressed aim of attracting students, "including girls, who might at first be reluctant, apprehensive, or uninterested." It has two components. The first is a 10-minute slide/tape presentation on how computers are used and who uses them (answer: for nearly everything, and by everybody, regardless of race, sex, age, ethnicity, or disability). The second part is a series of five software programs, designed to introduce students to a range of computer capabilities: "Three-D-Building," a three-dimensional building tool; "Nim," a game which helps students think about how computers learn; "Magic City," an interactive book; "Questions and Answers," a data-gathering tool; and "Clues," a tool for designing a guessing game. All materials are aimed at 4th through 7th grade students. *The Technology Garden* was developed with a grant from the Women's Educational Equity Act Program.

"1983 Microcomputer Usage In Schools," Quality Education Data, Inc., P.O. Box 4129, Denver, CO 80204. (303) 572-8692/(800) 525-5811. Free.

Quality Education Data, Inc. is a marketing and mailing list firm which provides educational data to businesses interested in the school market. The results of their survey on microcomputer use are published in this report.

"A CONCERN About . . . Computer Equity," *CONCERNS,* issue XII, Resource Center on Educational Equity, Council of Chief State School Officers, 400 North Capitol Street, NW, Suite 379, Washington, DC 20001. (202) 393-8159. Free.

This issue of CONCERNS, a quarterly newsletter to inform state education policymakers and staff on various educational equity topics, focuses on computer equity and contains specific suggestions for action by state educational policymakers.

Organizations, Projects

Center for Special Education Technology Information Exchange, Council for Exceptional Children, 1920 Association Drive, Reston, VA 22091. (703) 620-3660, (800) 345-TECH.

The Center for Special Education Technology Information Exchange is a new project of the Council for

Exceptional Children and two subcontractors, JWK International, and LINC Resources. The purpose of the Center is to act as a clearinghouse for information about technology advances and applications in the education of students with disabilities. The Center's information will be available by phone, mail, electronic networks, and a telephone hotline and taped message system. The Center will also convene a research symposium.

Computer Equity Training Project, Women's Action Alliance, Inc., 370 Lexington Avenue, New York, NY 10017. (212) 532-8330.

The Computer Equity Training Project is a two-year project of the Women's Action Alliance, funded by the Women's Educational Equity Act Program. The project focuses on middle schools, and intends to increase girls' computer learning at this age by developing school strategies to encourage girls to make greater voluntary use of computers.

CETP will produce a field-tested manual, *The Neuter Computer,* for middle school staff to replicate the project's approaches and strategies (see *Books*). A collection of materials on CETP and computer equity is available for $5.00 plus 15 percent for postage and handling.

Connecticut PEER, University of Connecticut Women's Center, U-118, Storrs, CT 06268. (203) 486-4738.

Connecticut PEER provides training and technical assistance in using the PEER manual, *Programming Equity Into Computer Education,* to community groups and school personnel in the state. Connecticut PEER also has produced a report on inequities in educational computing in Connecticut.

EQUALS in Computer Technology, Lawrence Hall of Science, University of California, Berkeley, CA 94720. (415) 642-1823.

EQUALS in Computer Technology is an in-service program developed by the award-winning staff of the EQUALS project. EQUALS began by developing workshops for teachers and students to increase the enrollments of girls in high school math and science courses. It provides teachers with classroom strategies and materials to encourage participation in computer courses as well as to help develop thinking skills necessary to technical work. The program also includes information and experiences that enable students to master computers.

EQUALS in Computer Technology programs are available at the Lawrence Hall of Science; the staff can travel to your school district, agency, or organization, and the program can be modified to run between two and five days. EQUALS in Computer Technology will publish a book in the fall of 1985, entitled *Off and Running,* which contains activities to teach computer-necessary skills that can be learned without a computer.

National Center for Computer Equity, Project on Equal Education Rights, NOW Legal Defense and Education Fund, 1413 K Street, NW, 9th Floor, Washington, DC 20005. (202) 332-7337.

The National Center for Computer Equity functions both as a national clearinghouse and forum for the exchange of ideas and programs on equity in computer education. Its purpose is to link together educators, parents, policymakers, business leaders, and researchers in defining and resolving

problems of discrimination and exclusion affecting girls of all ethnic and racial groups, including disabled girls, in computer education and vocational training. The Center publishes *Computer Equity Reports* on a broad range of computer equity issues; and *Computer Equity Action Kits* for use in local school districts and communities. In addition, the Center is now actively soliciting information on school and community programs that are successfully providing bias-free computer-based education.

Office of Opportunities in Science, American Association for the Advancement of Science, 1776 Massachusetts Avenue, NW, Washington, DC 20036. (202) 467-5438 voice or TTY.

For over ten years, the Office of Opportunities in Science has worked to increase the number of minority, female and disabled scientists in the natural, social and applied sciences. While nearly all of its work has been at the postsecondary and professional levels, it is included here because it has built extensive networks among the scientific community, and has recently begun examining mentorship programs at the secondary level (see *Equity and Excellence,* under *Books*).

Technical Education Research Centers, 1696 Massachusetts Avenue, Cambridge, MA 02138. (617) 547-0430 or -3890.

TERC is a non-profit research and development organization engaged since 1965 in educational research, development, dissemination, and technical assistance. TERC develops both educational software and curricular materials in mathematics and science, and also produces materials that address the educational needs of disabled students and women and girls.

Title IV **Desegregation Assistance Centers,** c/o Equity Training and Technical Assistance, U.S. Department of Education, 400 Maryland Avenue, SW, Room 2033, Washington, DC 20202. (202) 245-2181.

Named after the Section of the 1964 Civil Rights Act which established them, "Title IV Centers" are located in all ten federal regions to provide training and technical assistance to school personnel on race, sex and national origin discrimination. Their services are free to any school district which requests them. Many state education agencies also have Title IV funds to assist in implementing civil rights laws. For information on the Title IV center serving your state, and for the names of state education agencies with Title IV projects, contact the U.S. Department of Education at the above address.

Working Women Education Fund, 1224 Huron Road, Cleveland OH 44115. (216) 566-1699 or -9308.

Working Women Education Fund is a non-profit organization whose mission is to advance the status and working conditions of women workers. With a grant from the Women's Educational Equity Act Program, WWEF is developing a four-part training program to introduce women office workers to computer-related occupations. The Fund's staff is available now to conduct the training program and to conduct other workshops for clerical workers on career development in computer occupations. The Fund also carries out research on working women, produces policy analyses, and provides technical assistance.

GLOSSARY OF TERMS

Administrative Computing: Any of a number of computer applications used by administrators for school management functions, including keeping attendance records, student test scores, and payroll records.

Algorithm: A finite, step-by-step set of directions designed to solve a problem (for example, long division, or the process for computing a square root). Computer programs implement a series of algorithms for procedures such as reading files, storing files, adding, subtracting, and other arithmetic functions.

BASIC: Beginner's All-Purpose Symbolic Instruction Code. A popular programming language that incorporates simple English words and common mathematical procedures. Useful for both scientific and business applications.

Bit: The basic unit of computer memory. "Bit" is short for binary digit and can have a value of either 1 or 0.

Braille Edit: A brand name for a program which translates between Braille and English, and which provides voice, text or Braille output.

Bug: An error in a program or a defect in computer hardware that causes a malfunction in computer operation.

Byte: A basic unit of information in a computer. One byte is equivalent to one keyboard stroke (for example, a letter, a number, punctuation, or a space).

CAI: Computer-Assisted Instruction. CAI programs use the computer to deliver a lesson or to test a student's knowledge of a subject.

Chip: A small piece of silicon with electrical circuits imprinted on it. In computers, this is usually a microprocessor, containing both the central processing unit and the main memory systems.

CI: Computer Instruction. The teaching of computer programming. To be distinguished from CAI (computer-assisted instruction) in which the computer is used to deliver a lesson or to test a student's knowledge.

COBOL: Common Business Oriented Language. A computer language developed for business data-processing applications.

Computer: A machine that can solve problems by taking in data, processing it in a prescribed, or programmed manner, and then supplying the results.

Computer Application: Any technique for applying computer technology to the solution of a problem. Using a computer to compose music is an example of a computer application.

Computer Literacy: There are various definitions of computer literacy, including basic knowledge of programming, the ability to write a program, or simply the ability to run one. Being able to write programs as well as to run them is a critical skill, particularly for female, minority, and disabled people who have been underrepresented in high paying, "high tech" careers. Other typical components of computer literacy include a knowledge of how computers can be used, the history of computers, and social and ethical issues in computer use.

CPU: Central Processing Unit. The "brain" of the computer. This part of the computer is responsible for interpreting data and executive instruction.

CRT: Cathode Ray Tube. The picture tube of a television set or the display screen in many computer terminals.

Courseware: Instructional materials for the computer, including the program itself and the teacher guides and other print materials needed to deliver lessons in a classroom.

Data: The term used to describe all the words, sentences, numbers and instructions that might be generated and modified by a person or a computer.

Data Processing: Organizing, describing, rearranging, and changing information such as words, sentences, and numbers.

Disk: A piece of flat, rotating, circular plastic that is coated with magnetic material and used to store bits of information.

Disk Drive: An electromechanical device that stores information on or recalls information from a disk.

Drill and Practice Programs: A form of educational software which teaches a specific skill, such as multiplication or spelling, or which drills the user in a body of knowledge, such as the names of state capitals. Drill and practice programs are especially helpful for teaching basic skills and currently represent the most common form of educational software available. However, they do not use the computer's full potential as an instructional support.

FORTRAN: Formula Translator. A widely used programming language that was developed for solving mathematical and scientific problems.

Hardware: All of the physical parts of the computer, including the computer itself, the disk or tape drive, the keyboard, the video display terminal, and the printer.

Joystick: A lever often used in educational games which directs the computer to move objects around the video screen.

K: A symbol used to denote 1,000. In the world of computers, one K bytes of memory equals exactly 1,024 bits. A 64 K memory can handle approximately 64,000 bits of data.

Kurzweil Reading Machine for the Blind: A combination optical scanner and voice synthesizer. The optical scanner "reads" printed or typewritten material and translates the information into electronic signals. The voice synthesizer then translates the electronic signals into sound, essentially reading the material aloud.

Light Pen: A pen-shaped instrument for inputting data into the computer by passing the pen over the data. Also called a "light pencil" or a "wand reader."

Load: To put information into the computer's memory from mass storage, such as a tape or a diskette.

Logo: A high-level language designed at MIT to teach programming concepts to children.

Megabyte: A million keystrokes or bytes.

Memory: A circuit that stores information in specific locations where the computer can retrieve it as needed.

Menu: A list of routines which can be executed by pressing a key, moving a cursor, or manipulating some other data entry device.

Microcomputer: The smallest computers, also known as personal computers. The circuitry is usually contained in a simple chip or printed circuit board.

Modem: **Mo**dulator-**Dem**odulator. A device which attaches a computer to a telephone and allows transmission of data on a telephone line.

PASCAL: A powerful computer language designed for business and general use. Named for the 17th century French philosopher and mathematician, Blaise Pascal. Required for the advanced placement program in computer science of the College Entrance Examination Board.

Peripherals: External devices connected to the central processing unit and memory systems. Examples are disk drives, printers, graphics tablets, video display terminals, joysticks, and other input/output devices.

PILOT: A programming language developed for writing computer-assisted instruction courses.

RAM: **R**andom **A**ccess **M**emory. Any memory which can be written on or read from, and which can be erased and reprogrammed as frequently as necessary. RAM size is expressed as a quantity of bytes, such as 64K (64,000 bytes). RAM may be expanded by adding memory chips or memory boards.

ROM: **R**ead **O**nly **M**emory. Permanently programmed memory which stores the basic instructions for operating the computer. ROM cannot be erased or altered by normal computer operations. The programs stored in ROM are called "firmware."

Simulation: A computer program which "models" a system and which enables the user to see how the system is affected by changes in key variables. For instance, a computer simulation of a human body can help students understand circulatory, respiratory, and other life systems. An economic model can teach students about money supply and other financial matters.

Software: The computer programs, instructions, and procedures that control the hardware of the computer system.

Speech Recognition Devices: Attachments which allow users to speak rather than type commands or information into the computer. Especially helpful for users with visual impairments.

Speech Synthesizers: Attachments which are programmed to mimic speech and "read" the computer's output. Speech synthesizers can be especially useful to users who cannot see printed materials.

TTY: Abbreviation for the teletypewriter keyboard terminal, or a terminal which receives input by telephone.

Users' Group: A club for people who use the same brand of computer. Users' groups exchange information, share programs, trade equipment, and help one another solve computer-related problems.

This glossary is a synthesis of several other glossaries, from: *Computers for Everybody* by Jerry Willis and Merl Miller (Dilithim Press, Beaverton, OR 97075); *Guide to Software Selection Resources, Part One,* (Center for Learning Technologies, New York State Department of Education, Albany, NY and Northeast Regional Exchange, Inc., Chelmsford, MA); *Computer Literacy Introductory Course,* (Pennsylvania Department of Education, Harrisburg, PA); *The Computer Explosion: Implications for Educational Equity* by Sheryl Denbo (Mid-Atlantic Centers for Race and Sex Equity, the School of Education, the American University, Washington, D.C. 20016).

THE NATIONAL CENTER FOR COMPUTER EQUITY

helps parents, educators and community leaders eliminate the barriers that prevent girls, minority, disabled and low-income students from equal participation in computer education. Administered by the Project on Equal Education Rights of the NOW Legal Defense and Education Fund, with an advisory board of experts from the computer industry, education and the civil rights community, the Center works to make equity basic to computer education.

Why do we need a National Center for Computer Equity?

Because PEER and others have identified disturbing signs of bias in the distribution of computers between wealthy and poor schools, in the use of computers by girls and boys and in the availability of computer learning for minority and disabled students. For example, boys now outnumber girls in computer science courses by nearly two to one and in computer programming courses, where boys are approximately 64% of all students. But a PEER survey of five state departments of education found that girls comprise 80% of the students in business education programs, preparing to become the video display terminal operators, automatic data processing operators, and other low-paying, dead-end, "high-tech" workers. PEER's first computer equity report, *Sex Bias At the Computer Terminal*, can bring you up to date on the causes and consequences of discrimination in computer-related courses.

What does the Center do?

- **Publishes Computer Equity Reports,** like *Sex Bias at the Computer Terminal,* that examine equity issues in K-12 school instruction and extra-curricular activities, in vocational education, employment and training programs and in urban and rural schools;
- **Publishes Grassroots Kits and Guides** to help parents and community groups work for equity in their own local schools;
- **Collects and Shares Information** on model programs that have documented results in using computers as effective solutions to equity problems related to race, sex and disability bias.
- **Raises Public Awareness** among educators, researchers, business and industry leaders and the general public of the necessity of incorporating concern for equity into computer education;
- **Links Diverse Sectors** through information dissemination and brings leaders together at conferences and symposia to define and solve equity problems in computer education and vocational training;
- **Serves as an Advocate** at the national level for planned investment in the future of all children through the equitable distribution of technological resources.

Who can benefit from affiliation with the Center?

- **Parents** who want to make sure their children are being educated for jobs of the future and that their schools are doing all they can to promote achievement;
- **Teachers and Counselors** who need

- resources and help to incorporate equity concerns into their career counseling and teaching methods;
- **School Administrators** who must manage a careful and responsive transition to "high-tech" schools of the future by relying upon equitable recruitment techniques for computer education courses and planned growth in the distribution of precious resources;
- **Equity Advocates** who want to make sure that all students are free to achieve in computer education regardless of sex, race or disability;
- **Community Groups** who understand the importance of making sure that today's youth are not tomorrow's unemployed through effective and equitable preparation for viable careers.

How can I become part of the Center?

- **By joining** PEER's National Affiliate Network, you automatically gain access to the National Center for Computer Equity, its programs and publications, including regular news bulletins on computer equity. You also receive PEER's monthly newsletter, *Equal Education Alert*, a discount on *all* PEER publications, and individual technical assistance in working for educational equity at the state and local level.
- **By completing** a "survey of interests," you enable the Center to hook you up to our network of computer equity advocates.
- **By providing** the Center with background information on your school or program, through completion of the *Programming Equity into Computer Education* worksheets and other background information, you will help build the nation's *first* database of model programs concerned with computer equity.

To join PEER's National Affiliate Network, and gain access to the National Center for Computer Equity, complete the information below and return this with your check to PEER at 1413 K Street, N.W., 9th Floor, Washington, D.C. 20005. YOUR SUPPORT MAKES EQUITY BASIC TO COMPUTER EDUCATION!

- ☐ YES, I want to affiliate with PEER and gain access to the National Center for Computer Equity. Enclosed is my check for:
- ☐ $50 fee for an Organizational Affiliate (a chapter of a national organization, an independent local or state organization, a local or state agency, etc.)
- ☐ $50 fee for an Individual Affiliate who wishes to receive all additional Special Action Mailings sent to organizational affiliates
- ☐ $25 fee for an Individual Affilate Only
- ☐ $10 for Students and Others with Limited Resources

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Organization: _____

Address: _____

City: _____

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Sex Bias at the Computer Terminal—How Schools Program Girls

Computers in the Classroom

The technological revolution is overtaking our schools. Pressured by demands from parents for educational programs to prepare their children for new jobs in the "information society," and lured by the potential to help teachers teach more effectively, school systems across the country have purchased hundreds of thousands of microcomputers in the past five years. In 1983 alone United States schools spent nearly $500 million on computers and programs.[1] Yet in the midst of this new and exciting technological change, an old familiar story is emerging. Richer schools are acquiring computers more rapidly than poorer schools, giving their students a distinct advantage in competing in the job market of the computer age. And boys are learning about and using computers more in the schools than girls. Once again, the schools are becoming a breeding ground for a pattern of opportunity based on sex, race and class rather than on abilities. For the young women of tomorrow's "high tech" world, missed opportunities carry a potentially double threat—for them and for their children. For as women become a larger and larger share of the nation's poor, it is their children—male and female—who become the new "technopeasants" in an increasingly technological world.

The Advantages of Wealth

> *The most outstanding implication of the new information technology is that it is utilized first by those who can afford it.*
>
> —Klaus Lenk
> Club of Rome[2]

Traditional patterns of exclusion begin with inequities in the distribution of computers. A national survey

conducted in 1984 by Quality Education Data, Inc. found that 75 percent of the nation's public schools now use microcomputers.[3] However, the same study found that wealthier communities are more likely to have computers, as are schools with larger student enrollments. This study is the latest in a growing series of independent studies that confirm the same disturbing trend—students at wealthier, suburban schools are reaping the benefits of the national push for computer literacy. A 1983 Johns Hopkins University study found that only 64 percent of high schools in low income, rural and predominantly minority areas had computers, compared to 86 percent of schools in more affluent, suburban communities, particularly in the Northeast.[4] An analysis of data from the National Assessment for Educational Progress found that only 15 percent of the 13-year olds from rural schools and urban schools reported that they had used computers. Over 30 percent—twice as many--of their counterparts in richer urban and suburban schools used computers.[5]

Even when schools have computers, they rarely have enough for all interested students. Only 18 percent of the nation's high schools have a ratio of one computer for every 50 students; and this provides only one-fourth of the student body with 20 minutes of computer time daily. The median student-to-computer ratio is 125 to 1 at the high school level; it is much higher in the larger urban school systems.[6] According to a 1983 survey by the Council of Great City Schools, its members—including the 32 largest city school systems in the country—average 186 students to each computer.[7] A state-by-state comparison published as part of the Quality Education Data survey showed a range from 62 students per computer in South Dakota to 1,072 students per computer in Hawaii. Most states seem to average between 100 and 200 students for each computer.[8] Furthermore, the gap between rich and poor is widening. Schools which already have computers are much more likely to buy more equipment than are schools which have not yet started using computers, according to the Johns Hopkins study.

The Impact on Women and Girls

If this pattern of access based on wealth continues, it will be devastating for women, who predominate among low income persons, particularly if they are raising their children alone. Two-thirds of the nation's poor adults are women, and women who work full-time outside the home—now the majority of adult women—earn considerably less, approximately 60 percent less, than men.[9] Families headed by single women are more than twice as likely to live in poverty than are families headed by single men, and five times more likely to be poor than families with both parents present.[10] Clearly, the children raised by women alone are much less likely to have access to computers in the classroom.

While the poverty status of a mother affects both her sons and daughters, her daughters will be much less likely to overcome the obstacles of poverty, including an inferior education. In addition to sexism in schools, women still face extensive discrimination in the job market—discrimination which is difficult to overcome under any circumstances, and nearly impossible without job skills. For most girls, high school provides the only opportunity to learn the basic computer and technical skills leading to better paying technological jobs instead of the lower-paying data entry or word processing jobs.

Unequal Access—Enrollment Patterns

But simply having computers in the school building does not guarantee equal access for girls. Surveys of classroom enrollment patterns consistently show that girls are not participating on an equal basis with boys in computer programming courses, the basic courses for gaining control of the computer's potential. For example, at the high school level, boys outnumber girls 2 to 1 in the academic based courses in computer programming, according to independent surveys conducted in three states.

Enrollment of Young Women in High School Computer Programming Courses[11, 12, 13]

State	Year	Percent Male	Percent Female
California	1981-82	62.5	37.5
Maryland	1980-81	64.1	35.9
Michigan*	1981-82	64.0	36.0

By contrast, girls outnumber boys by more than three to one in business education courses that will lead them into the "pink collar ghetto" of the future—to jobs as word processing equipment operators and data entry clerks, for example.[14]

The Gender Gap in the Computer Classroom

These lop-sided enrollment patterns appear to have nothing to do with ability or performance. A more subtle influence is at work; boys, with the tacit approval of the schools, develop a computer subculture which excludes girls. It is a high tech version of the clubhouse where "no girls are allowed."

The barriers are both structural and psychological. For example, computer programming courses are typically offered in the mathematics department, and are often treated as advanced studies reserved for the brightest math students, traditionally assumed to be male. Surprisingly, the problem does *not* appear to be that girls drop out of advanced math courses at a significantly faster rate than boys, and therefore cannot qualify for computer instruction courses. In fact, 47 percent of all girls graduating high school in 1981 had taken Algebra II, as compared to 51 percent of their male counterparts, a difference of only four percent.[15]

Instead, some researchers think that more girls than boys *perceive* computer programming as "too difficult." Despite increasing enrollments in math, and efforts by feminists to break stereotypic molds, girls more often

*Data from a non-random sample of 80 school districts out of 560, collected by the American Association of University Women and Michigan PEER.

than boys are less confident of their mathematical abilities and think that mathematics will be less useful to them than boys.[16] Dennis D. Cole and Michael J. Hannafin of the University of Colorado found significant sex differences among their students' *perceptions* of the difficulty of computer courses. More girls than boys *incorrectly* assumed that computer programming *required* a background in advanced math and even the hard sciences, such as physics and chemistry. At the same time, girls expressed a lack of confidence in their ability to learn computer skills more often than did boys.[17]

Computer Literacy—Building Confidence and Skills

The "gender gap" in perceived abilities could be overcome by requiring a course in basic computer literacy for all students. Several studies and many testimonials from teachers and students show that girls overcome their anxieties quickly and perform as well as boys. A study conducted by the University of Pittsburgh concluded, after 10 years of observing seventh through twelfth graders, that boys and girls who were experienced in computer use had similar attitudes towards the computer and that there was no difference between the girls' and boys' performance.[18] There is strong evidence that girls' lower test scores in computer skills, reported by the National Assessment of Educational Progress, reflect a difference in experience rather than aptitude; only four percent of the girls had taken at least one semester of computer programming, compared to 14 percent of the boys.[19] "It's important to keep in mind that many, many girls are exceptionally good at math and computer programming—and believe rightly that they are," cautioned Dr. Elizabeth Fennema, a mathematics education researcher at the University of Wisconsin-Madison. "Overall, the differences between males and females are really very small. It's just that the students who are less confident are more often girls."[20]

Fun with the Computer—"The Intellectual Equivalent of Football"

By most accounts, boys seem to gravitate to the computer more and to be more aggressive about getting their turn; they are more apt to come in early or stay late, join computer clubs, or use free time during the school day to "play with the computer."

"Girls and boys do equally well in class on the computer, but it's the boys who become computer jocks," comments Barbara Dubitsky, director of the computer certificate program for teachers at the Bank Street College of Education in New York City. The Bank Street College recently completed a three-year study of how computers affect problem-solving, learning and social behaviors of the elementary school students in their lab school. "We find that boys get more status from their peers for being good at the computer. It's the intellectual equivalent of football." She added, "One of our brightest students is a girl. But there are almost no girls among the clique of kids who spend all their spare time at the terminal."[21]

Boys also predominate over girls in computer camps and summer classes by a ratio of roughly three to one. Further, the male/female ratio in expensive computer camps is much greater than in less expensive camps, leading researchers to conclude that parents are more willing to invest in computer training for their sons than for their daughters.[22] These data simply confirm the persistence of sex stereotyped expectations and biased assumptions that discourage girls, both subtly and overtly, from aggressive participation in both computer education and games.

Ending Bias—The Role of Teachers

The lack of trained computer educators aggravates inequities in enrollments. At present, very few teachers have been trained to conduct computer-based education programs. In fact, educators frequently report that students' and teachers' roles are reversed when it comes to computer instruction. The National Education Association estimates that only 21 percent of teachers have some computer training.[23]

One result of the teacher shortage and the urgent efforts to retrain teachers is that equity issues are being largely ignored; little, if any, attention is paid to whether teachers are sensitive to bias in the classroom, both in their own behaviors and in curriculum materials. Instead, most administrators are concentrating on establishing basic computer literacy programs, and teachers are concentrating on learning the curriculum. Without specific attention to often subtle forms of sex bias and stereotyping, schools are in danger of building in the same biased practices that produce sex segregated enrollment patterns in the first place. Curriculum development and teacher training programs must address the teacher's role in discouraging and encouraging students, particularly girls and minority boys.

As role models and authority figures, teachers have a tremendous influence on the self-images and aspirations of their young students. Research on women professionals in science and mathematics careers has found that nearly all of them pinpointed a close relationship with a supportive teacher as the most crucial turning point in their student careers. Yet biased teacher behavior—often unwitting and unconscious—frequently discourages girls from seeking achievement in these fields.

Computer-Assisted Learning—Fair and Equal Feedback

Computer-assisted learning can help break through the negative atmosphere created by biased teacher attitudes—if the programs are written well. Good computer-assisted learning programs reinforce correct answers and point out incorrect ones equally, regardless of sex, race, national origin, or disability. Even after repeated errors, a well-written program draws no conclusion about the user's innate abilities. The positive aspects of this immediate, direct and objective feedback have been noticed and described by researchers. A four-year study by the Educational Testing Service of the effects of computer-assisted instruction (CAI) in the Los Angeles Unified School District found that students who had been performing at a level below average made significant improvements in all the basic skills, particularly in mathematics.[24]

The report noted that one of the advantages of the particular drill-and-practice programs used in Los Angeles was immediate feedback provided by the computer. Students frequently mentioned the relief of making mistakes in private; because their anxieties about failure diminished, students' capacity for learning increased. Teachers regularly cited students whose confidence and performance improved; as a result, *their* feelings about—and behavior towards—the students changed. If software developers could advance beyond crude, over-simplified and biased software, the computer could potentially help break an important and difficult element of sexism in education.

Patricia Campbell, a leader in efforts to ensure bias-free education who is developing educational software, commented recently that bias-free software can help all students—girls and boys—overcome a lack of confidence that typifies students who do not do as well as they could in any subject area. "Many students, for example, are afraid of breaking equipment in the science lab, so they don't really focus on what the experiment can teach them. The computer is an excellent way to simulate laboratory conditions, risk-free. In fact, a student can run the same experiment dozens of times, changing variables to see how they alter results. Simulation software can be a terrific tool for all students, of course, but particularly for the girls who think that science is off-limits for them."[25]

Interwoven throughout educational software programs is the unique interactive capacity of the computer. Unlike any other information technology the computer can "talk back;" it can be modified by input from the learner and can modify the learner's behavior. Because of this interactive capacity, the computer may be an important tool in helping the school tackle a persistent and serious pedagogical problem affecting girls more than boys: teaching problem-solving skills.

While educators remain divided on the long-range ability of computer-assisted instruction or learning computer programming to improve problem-solving skills, the question is a crucial one for girls, and one which educators committed to equality should seek to answer. Debates among educators about the value of computer literacy programs will continue, and must be joined by advocates for equal educational opportunities for girls and women, to ensure equity in computer education and in computer-related careers.

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[1]Joseph A. Menosky, "Computer Worship," *Science '84*, May 1984, p. 40.

[2]Klaus Lenk, "Information Technology and Society," in G. Friedrichs and A. Schaff, eds., *Microelectronics and Society*, NY: Pergamon Press, 1982, p. 310.

[3]Quality Education Data, Inc. *The 1983-84 Microcomputer Usage in Schools Survey*, 70 W. Sixth Avenue, Denver, CO 80204.

[4]The Johns Hopkins University, Center for Social Organization of Schools, *Microcomputers: A National Survey*, Issue No. 3, April 1983.

[5]Ronald Anderson, University of Minnesota, Minneapolis, MN, *Computer Inequities in Opportunities for Computer Literacy*, an abstract presented at the National Educational Computing Conference, Baltimore, MD, 1983, Mimeographed.

[6]The Johns Hopkins University, Center for Social Organization of Schools, *Schools' Uses of Microcomputers*, Issue No. 2, June 1983.

[7]Sally Banks Zakarya, "The Rich Get Computers; The Poor Get Poorer," *The American School Board Journal*, March 1984, Vol. 171, No. 3, p. 30.

[8]Quality Education Data, Inc., *op. cit.*

[9]U.S. Department of Commerce, Bureau of the Census, *Money, Income, and Status of Families and Persons in the U.S.: 1982*, Table 17, Washington, D.C.: U.S. Government Printing Office, July 1983, Table 11, p. 17.

[10]*Ibid.* Table B, p. 4.

[11]Nancy Kreinberg and Elizabeth Stage, "EQUALS in Computer Technology," in J. Zimmerman, ed., *The Technological Woman: Interfacing With Tomorrow*, NY: Praeger, 1983, p. 253.

[12]Maryland Women in Math and Science, Task Force Report, mimeographed, n.d.

[13]Michigan Project on Equal Education Rights, *Math Report* Milford, MI, 1982 (available from PEER, 1413 K Street, N.W., Washington, D.C. 20005).

[14]Based on a telephone survey of state department of education staff in charge of vocational education in California, Arizona, Massachusetts, Virginia and Minnesota. Survey conducted by Dr. John Lipkin and the Project on Equal Education Rights, July 1983.

[15]U.S. Department of Education, National Center for Education Statistics, *Digest of Education Statistics, 1982*, Table 64, Washington, D.C., p. 71.

[16]Elizabeth Fennema, "The Sex Factor," in Elizabeth Fennema, ed., *Mathematics Education Research: Implications for the '80s*, Reston, VA: Association for Supervision and Curriculum Development, National Council of Teachers of Mathematics, 1981, p. 92.

[17]Dennis D. Cole and Michael J. Hannafin, "An Analysis of Why Students Select Introductory High School Computer Coursework," *Education Technology*, April 1983, p. 28.

[18]F. Bell, "CAI and Computer Literacy: A Ten Year School/University Project," in *Proceedings 18th Annual Convention*, St. Louis, MO: Association for Educational Data Systems, 1980.

[19]R. Anderson, D. Klassen, K. Krohn and P. Smith-Cunnien, *Assessing Computer Literacy; Computer Awareness and Literacy: An Empirical Assessment*, Final Report, St. Paul, MN: The Minnesota Educational Computer Consortium, 1982, p. 91.

[20]Telephone interview with Dr. Elizabeth Fennema, April 2, 1984.

[21]Telephone interview with Dr. Barbara Dubitsky, Bank Street College of Education, July 1983.

[22]Robert Hess and Irene Miura, "Sex and Class Affect Summer Camp Enrollment," *Infoworld*, Vol. 5, No. 17.

[23]National Education Association, *A Teacher Survey NEA Report: Computers in the Classroom*, Washington, D.C.: NEA, 1983.

[24]Marge Ragosta, Paul Holland and Dean Jamison, *Computer-Assisted Instruction and Compensatory Education: The ETS/L.A. U.S.D. Study, Final Report*, Princeton, NJ: Education Testing Service, 1982.

[25]Telephone interview with Dr. Patricia Campbell, April 3, 1984.

PEER, the Project on Equal Education Rights of the NOW Legal Defense and Education Fund, is one of the leading national advocacy programs for educational equity for women and girls of all racial and ethnic groups. PEER's National Affiliate Network links activists and educators in a national community of concern for the advancement of women.

Created in 1974, the project has received support from various sources, including the Carnegie Corporation, the Ford Foundation, the Rockefeller Family Fund, the Charles Stewart Mott Foundation, several corporations, and the Women's Educational Equity Act Program, U.S. Department of Education.

This report is based on an extensive research paper by John Lipkin and Lynda Martin McCormick. To order more copies of *Sex Bias at the Computer Terminal—How Schools Program Girls*, write PEER, 1413 K Street NW, 9th Floor, Washington, DC 20005. (202) 332-7337. $3.00/copy. Make check or money order payable to PEER. Bulk rates available.

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LEADING WOMEN'S ADVOCACY GROUP ON EDUCATIONAL ISSUES LAUNCHES SECOND DECADE OF ACHIEVEMENT FOR WOMEN

PEER Responds to Grassroots Survey With New Issues and Publication Series to Keep Women's Education on National Agenda

WASHINGTON, D.C. —— As a second Reagan Administration goes about setting its new agenda in motion, one of the nation's leading women's advocacy groups will also be inaugurating a new series of programs designed to ensure a second decade of educational achievement for women and girls.

In its first decade, PEER established itself as the nation's leading comprehensive project devoted entirely to achieving educational equity for all women. It is well known for its development of tools to help parents and community groups work for sex equity in their own local schools. PEER has been influential in the enactment and implementation of federal laws supporting women's educational equity, including Title IX, the Women's Educational Equity Act (WEEA), Title IV of the 1964 Civil Rights Act and the Vocational Education Act of 1984.

"PEER's second decade agenda responds directly to the concerns of parents, teachers and students across the country who are worried that women's long march toward educational equity and economic self-sufficiency may be lost in a new agenda of budget cuts, deficit balancing and defense build-ups," says Leslie R Wolfe, director of the Project on Equal Education Rights (PEER) of the NOW Legal Defense and Education Fund.

—— more ——

In an effort to determine what issues were most important to its constituency as it entered its second decade, PEER surveyed locally-based women's rights groups, colleges and universities, professional associations, job training projects, state and local education offices, state commissions on the status of women and groups representing minority and disabled women. Respondents from 37 states and the District of Columbia provide a grassroots view of women's concerns. According to the PEER survey results,

- nearly 1 in 3 respondents are concerned about the impact of budget-related cuts on women and women's programs (including the Women's Educational Equity Act, Title IV of the Civil Rights Act and other federal education programs that serve women, minorities and disabled persons);

- nearly 1 in 5 express concern over "high tech" issues such as women's access to math/science education and high tech careers, as well as computer education and careers;

- approximately 1 in 6 emphasize the importance of attention to the education and work connection, especially vocational education and employment training;

- other issues figuring prominently in the survey are early childhood education, teen pregnancy, excellence and equity and disability rights.

In direct response to this survey, PEER will be concentrating its second decade efforts in the following five areas:

- education and work, which explores the theme "equal education is poverty prevention for women" and emphasizes that the antidote to the feminization of poverty is public education which prepares women for the job market of tomorrow;

- excellence and equity in education which focuses on the need to ensure that reforms in the schools are not won at the expense of equity and that schools encourage girls and young women to enroll in vocational education, math and science courses;

- computer equity, centering around PEER's recently established National Center for Computer Equity which will link educators, business leaders, researchers, parents, teachers and equity advocates in defining and solving issues of discrimination and exclusion affecting the participation of girls of all ethnic groups in computer education and vocational training.

— more —

- teen pregnancy prevention, focusing on the importance of nonsexist career education and counseling for girls and young women, to counteract the negative effects of sex and race stereotyping;

- early childhood education with an emphasis on improved nonsexist, nonracist training and curriculum for preschool teachers, child care workers, and parents.

Additionally, PEER will be building a new National Affiliate Network designed to empower parents and teachers at the local level to work more effectively and cooperatively for equity within their school systems and communities. The affiliate structure links local groups to PEER and to each other through ongoing contact and referral.

In response to a strong need for information at the grassroots level, PEER will also be producing more topical reports in 1985 than during its first nine years combined. The following are now scheduled for publication as part of the PEER Reports series:

- Sex Bias at the Computer Terminal looks at the recent research documenting how schools are programming girls away from the computer skills they will need to compete for jobs in the information society of tomorrow (now available);

- Like She Owns the Earth reviews the myths and realities surrounding women's particiption in sports throughout history —— from classical times through the 1984 Olympics (available February 1985);

- A Citizens Guide to the Sex Equity Provisions of the Vocational Education Act of 1984 examines the new law and how it may be implemented locally (available March 85);

- PEER's Second Decade Public Policy Agenda for Achieving Equal Rights for Women and Girls in Education sets out positions on key issues from the enforcement of Title IX to teachers' salaries (available April 1985);

- The Classroom Climate for Girls in Elementary and Secondary Schools examines those factors in the everyday classroom —— from teachers' expectations to the availability of role models —— that may influence the achievement and performance of girls (available May 1985).

—— more ——

"A new generation of American women deserves to grow up free from harmful stereotypes, with the full options of education and employment open to them," says PEER director Leslie Wolfe. "PEER's second decade will be devoted to their achievement by expanding our reach through a national network and deepening our commitment to full equality for women in education."

# # #

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NATIONAL CENTER FOR COMPUTER EQUITY LAUNCHED BY PEER

New Report Documents Gaps Between Girls and Boys in Computer Skills

WASHINGTON, D.C., December 18 -- Will the technological revolution open new opportunities for our children, or will it only reinforce old patterns of bias against poor children, girls, minority and disabled children? Is the gap between rich and poor widening rather than closing as the education system enters the computer age? These are the questions which a new National Center for Computer Equity plans to explore and address through the development of a national network of educators, women's advocates and computer industry leaders. The establishment of the Center was announced today by PEER, a project of the NOW Legal Defense and Education Fund, which serves as the national forum for educational issues as they affect women and girls.

According to Leslie Wolfe, director of the Project on Equal Education Rights (PEER), there is growing concern that the promise of computer-based instruction for eliminating bias in the schools is not being fulfilled. "The technological revolution is overtaking our schools," says Dr. Wolfe. "In 1983 alone, American schools spent nearly $500 million on computers and programs. Yet in the midst of this new and exciting technological change, an old familiar story is emerging. Once again, the schools are becoming a breeding ground for a pattern of opportunity based on sex, race and class -- rather than on ability. With the help of the Center, educators, business leaders, researchers and equity advocates will be able to come together to define and solve these and other problems in computer education and vocational training."

---more---

The Center, which the Project on Equal Education Rights will administer, will provide a national forum for evaluating the progress of new technological resources in ensuring that all children --- regardless of sex, race or disability --- have equal access to the tools and training that will determine their future in the workforce.

In conjunction with its opening, the Center has published the first in a series of Computer Equity Reports which will be released by PEER in 1985. Sex Bias at the Computer Terminal --- How Schools Program Girls (available from PEER for $3.00 per copy) states that "simply having computers in the school building does not guarantee equal access for girls." PEER's research reveals a disturbing pattern of continued bias and privilege in the nation's computer education. Among PEER's findings are the following:

> Girls are not participating on an equal basis with boys in computer science courses, where boys outnumber girls by nearly two to one, or in computer programming courses, where boys are approximately 64% of students and girls are only 36%.
>
> By contrast, 80% of the students in business education programs are girls who are preparing to be the office workers of tomorrow: video display terminal operators, automatic data processing equipment operators, and other low-paying, dead-end "high tech" jobs.
>
> This disparity persists despite the fact that many girls have conquered "math anxiety" --- 47% of all girls graduating high school in 1981 had taken algebra II, compared to 51% of their male counterparts.
>
> Boys predominate over girls in computer camps and summer classes by a ratio of roughly 3 to 1, leading researchers to conclude that parents may be more willing to invest in computer training for their sons than for their daughters.

The implications of the data are sinister for girls --- of the top 10 fastest growing jobs, according to the Bureau of Labor Statistics, 5 require the ability to use a computer or other sophisticated technology.

---more---

PEER cautions that without specific attention to often subtle forms of sex bias and stereotyping, schools are in danger of building the same biased practices that produce sex segregated enrollment patterns in the first place.

"We must realize the great potential of the computer for eliminating bias in the schools," says Dr. Wolfe. "The computer draws no conclusion about the user's innate abilities. It gives feedback regardless of the user's sex, race, national origin or disability. This unbiased tool, if properly used, can help us eliminate barriers which currently impede the progress of some children. But these children must have equal access and equal encouragement."

PEER's new Center will publish papers on a broad range of national, state and local computer equity issues, including:

> the education-to-work connection, an assessment of the skills that will be "gateway" skills to technological jobs in the future;
>
> the potential of the computer to neutralize biased teacher behavior in the classroom;
>
> equity issues in the use of computers to aid disabled students; and school and community based programs that work.

The Center's next publication, a Computer Equity Action Kit, will be available in early 1985. The kit will include specific strategies to help parents, educators and activists assess and improve their schools' computer education programs. Additionally, the Center is now actively soliciting information on school and community programs that are successfully providing bias-free computer-based education.

To receive more information about the Center and its publications, write the National Center for Computer Equity at PEER.

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